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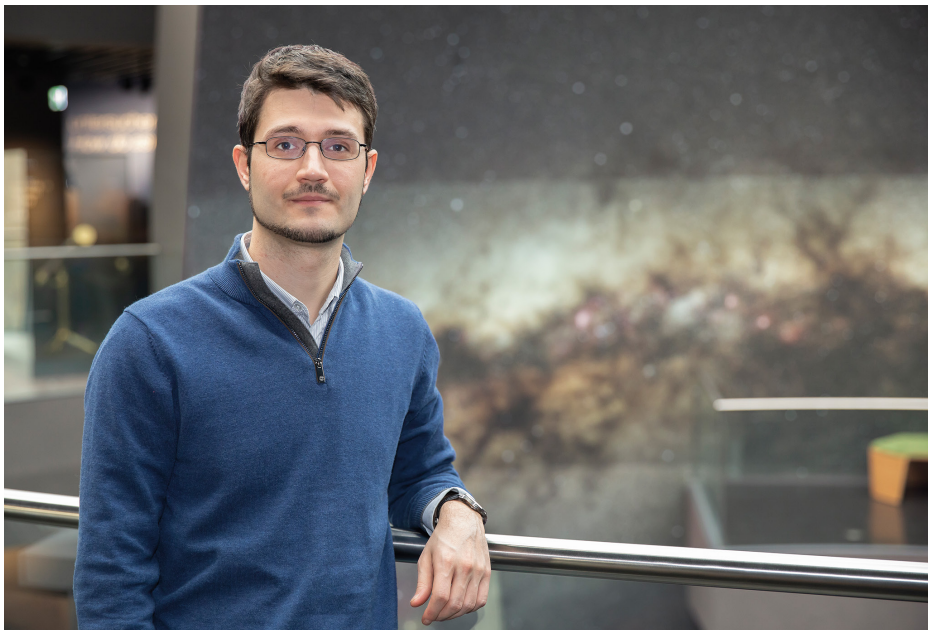
Fellows at ESO

Francesco Belfiore



The light is different in the Atacama Desert. I will never forget the colours of the sunset driving down the road leading away from the Atacama Large Millimeter/submillimeter Array (ALMA), after a busy day's work attaching cables to electronics boxes in a crammed space at the back of the Atacama Pathfinder EXperiment (APEX) telescope. Hosted on the Chajnantor plateau, at an elevation of around 5100 m above sea level and right next to ALMA, the APEX telescope is a small island of state-of-the-art astronomical equipment in the middle of a seemingly Martian landscape.

As an ESO fellow I spend part of my functional duty time as support astronomer for APEX. This experience has allowed me to perform a wide variety of observations for scientists from different ESO Member States, but also given me first-hand experience of the challenges involved in running a world-class observatory — including the mild dizziness associated with working at more than 5000 m above sea level.

I came to astronomy by an indirect route. At school I liked both acting and mathematics. I am still fascinated by the storytelling aspect of performing in plays and the adrenaline rush of walking onto a stage. As for mathematics, I admire the logical constructs of Euclidean geometry, which one of my teachers in high school in Catania, Sicily, was particularly good at presenting. Aged 16 I was awarded a full scholarship to attend the United World College of the Adriatic[1], an international residential high school in Duino, Trieste. In Duino I had my first encounter with experimental science in a well-stocked chemistry lab. To my chemistry teacher Anne Brearley I owe my decision to apply to read Natural Sciences at the University of Cambridge in the UK.

I loved the undergraduate courses and the student experience in Cambridge. I specialised in physics and mostly enjoyed the theoretical physics courses. For my masters thesis I approached Paul Alexander, who guided me through a theoretical study of the 21-centimetre atomic hydrogen signal from cosmic reionisation. I greatly enjoyed the work, which brought together so many different aspects of the physics, from quantum mechanics to cosmology. I felt, however, that I was missing the thrill that comes from experimental verification. I therefore applied for a PhD in observational astronomy. I have to thank my PhD advisor, Roberto Maiolino, at the Cavendish astrophysics group in Cambridge, for giving me the chance to meet this challenge head on.

Even in the first few months of my PhD, Roberto gave me a great amount of freedom to pursue my own ideas and encouraged me to get involved in MaNGA (Mapping Nearby Galaxies at APO — APO is the Apache Point Observatory), a large international collaboration with several key members based in the USA. The collaboration has been using the Sloan Digital Sky Survey (SDSS) 2.5-metre telescope to conduct an unprecedented survey of nearby galaxies with integral-field spectroscopy. Joining the SDSS-MaNGA collaboration was a defining event in my professional career. I got involved in many aspects of the survey, from planning and data analysis, exploring the first datasets, writing technical documentation and organising activities for early career researchers joining the collaboration. My work was scrutinised by people other than my advisor, and sometimes strongly criticised, in regular meetings and telecons. Most of what I know about observational astronomy I owe to the fantastic group of people in MaNGA.

From the time of my PhD, my work has been dedicated to studying the chemical make-up of galaxies to draw conclusions about their origins and evolution. My PhD advisor was instrumental in my long-term interest in the physics of the interstellar medium. I am also grateful to Francesca Matteucci and Fiorenzo Vincenzo for introducing me to the beauty of chemical evolution modelling. The appreciation of this theoretical framework has given me insight and motivation for my observational work. The long-term goal of my research is to trace the history of how disc galaxies assembled by tying their star-formation histories with their current and past chemical abundances.

After seven and a half years as a student in Cambridge I was keenly aware that I needed to expand my academic horizons. When Kevin Bundy, the Principal Investigator of the MaNGA survey, offered me a job at the University of California, Santa Cruz (USA), I happily accepted. In November 2018 I moved back to Europe and arrived at ESO as a new fellow. I immediately felt that I was no longer just a postdoc, but a valued member of the observatory team and of the scientific community in Garching. I wanted my time at ESO to be a learning experience and a

time to expand my skill set. I therefore decided to split my functional duty time between outreach at the ESO Supernova Planetarium & Visitor Centre and working as an APEX support astronomer. I had extremely limited experience of submillimetre astronomy before taking the job at APEX, but Carlos de Breuck and Palle Møller gave me a crash course during my first time in Chile. Overall, ESO combines many of the aspects I most enjoy about doing astronomy: an open and international environment, an amazing group of peers, and the ability to draw direct links between ideas, instruments and observations.

Links

[1] The United World College of the Adriatic: https://www.uwcad.it/

Romain Thomas

I have always been curious. Since I was a kid, I have always loved to try to understand how things "work". That's why I have always liked science in general and physics in particular. However, unlike some of my colleagues, the astronomy direction came later when I was a young adult.

After my high-school diploma, I went to preparatory classes in physics and technology for two years (*classes préparatoires* in the French system). These years are generally preparation for engineering schools, and include a heavy load of physics, mathematics, and in my case, engineering science. It is during these years that I started to consider doing research in fundamental science. After these two years, I enrolled in the magistère of fundamental physics at the Université Paris-Sud during the last year of my bachelor degree. It is at that moment that I started to become interested in astronomy, at first from a theoretical point of view in the fields of cosmology and general relativity. During my masters degree, I enrolled in all the available astrophysics classes. It started to become a passion for me, which is why I spent two internships at the University of La Plata in Argentina to work on black hole entropy and co-authored my first paper!

After two years of masters work, I started a PhD with Olivier Le Fèvre in the Laboratoire d'Astrophyque de Marseille (LAM) to work on an ongoing high-redshift galaxy survey, the VIMOS Ultra Deep Survey (VUDS). The thesis aimed to study when galaxies are born. Those 3+ years were a challenge, composed of periods of success, some failures and a lot of sleepless nights. I really enjoyed it because this was really about trying to understand what we see in the sky and why it appears as it does. I learnt a lot about data processing and how to do scientific analysis. I have always been amazed by how many different science areas you can address using the same sample of objects and how you can connect them. It is also where I discovered another passion, software development. I learned how to use and write code, and since then I have never stopped.

From a more personal point of view, this experience was also amazing. The large team working on this project involved people from very different cultures. It made me appreciate working in such an environment and I wanted to continue. After my PhD I flew to Chile, to the University of Valparaiso, for a two-year postdoctoral position. During these two years, I joined the collaboration of another high-redshift galaxy survey, VANDELS. This collaboration allowed me to go for the first time to the Very Large Telescope (VLT) to observe with the VIsible Multi Object Spectrograph (VIMOS), which is now decommissioned. This first contact with Paranal was like a dream. I completely fell in love with the observatory, and I realised this is the kind of place I want to work in. So I applied for an ESO fellowship and got accepted!

I have been at ESO for almost three years now, and it has been the most thrilling experience I could ever dream of. As an ESO fellow, I have 80 days/nights as a support astronomer, which results in, on average, one shift per month. I am always excited to go to the observatory. The first few months are not easy because there is a lot to learn and to remember but carrying out the observations is really exciting. I always wonder, when looking at the data we gather, what people will make of them. Our work is also to make sure that these data or of the best quality. I am now support astronomer of both UT1 (Antu) and UT2 (Kueyen), which mainly use spectrographic instruments. In parallel with core operational duties, I am leading a team writing a system for data visualisation called SCUBA. It is the first time that I have been in charge of such a large project and has very much helped me to understand how the Paranal system and how each instrument work. The most challenging part of this fellowship is to keep up with the science. In the beginning, it is easy to get "swallowed up" by the duty side of the work, but that becomes easier over time. I am also fortunate to be involved in extensive collaborations, which definitely prevent me from losing track of that aspect.

Romain Thomas

Camila Navarrete

You might think that my decision to be an astronomer was straightforward, being Chilean, and with Chile being the focal point of a huge fraction of the current telescope light collecting area worldwide. Nevertheless, during my childhood I had never heard of astronomy as a potential professional career. And having grown up in Santiago — the capital of Chile — I could never appreciate the night sky. Although ever since I can remember I was always really fascinated by physics. I enjoyed the challenge of solving a physics problem, identifying the different forces involved, solving equations and then predicting what was going to happen to the object of study as a result.

I remember my physics teacher at high school was extremely demanding, sometimes asking us to solve problems that were closer to university level. Instead of feeling overwhelmed by this, I felt encouraged to solve these problems, even looking for higher-level textbooks with my friends. One year before finishing high school education I hadn't decided what to do next — possibilities included engineering in physics, or a bachelor's degree in physics or even literature. I had always loved reading novels and the classics, and that was also a secret option at that time.

During the summer holidays before my last year of high school, I heard in the news that the best students in Chile were choosing astronomy as a career. My first reaction was of incredulity and then of curiosity. Why astronomy? I didn't have any education in astronomy in school, so I decided to enroll in a month-long summer school in astronomy directed by the University of Chile. Frankly, I really just wanted to know what astronomy was about. The campus was near my house and the classes were just 1.5 hours in length every afternoon, so it wasn't a huge sacrifice of my last summer holidays as a high-school student. After the first classes, I was amazed. Why hadn't I known about all of these applications of the laws of physics before? After four weeks and one visit to the local university observatory, I had decided. I wanted to become an astronomer.

I was so determined to do astronomy that I chose a bachelor's degree in astronomy at the Pontificia Universidad Católica de Chile, which at that time was the only university in Santiago with direct access to that field. After four years of classes, I was most interested in stellar astronomy, stellar interiors and variable stars. I started to work on my bachelor thesis studying Δ Scuti low-amplitude variable stars in three open clusters, using infrared observations. To find variable stars, several images of the same area have to be collected in order to recover the stellar light variations over time. My first study was completely disappointing as I couldn't recover any variability despite some of the stars in the cluster being known to be variable. But that was not really surprising, variable stars tend to have smaller variations in the infrared compared to the optical, where most of the variables have been discovered so far.

After finishing my bachelor's degree, I started the master's programme at my former university. At that time, in 2011, my plans were absolutely defined — I would do the two years of a master's and then start to apply to do a PhD abroad. During my master's I decided to do a similar but much more challenging project; I used several near-infrared observations from the Visible and Infrared Survey Telescope for Astronomy (VISTA) at Paranal to find and characterise the variable star population of the biggest globular cluster in the Milky Way, Omega Centauri. This cluster hosts more than 500 known variable stars of different types, including some of the best distance indicators we have in astronomy. In my master's thesis I recovered the variability of more than 300 variables in infrared bands, comparing their amplitude with the amplitude of variability in the optical and deriving a very precise distance to Omega Centauri using the period-luminosity relation. This relation — first discovered by Henrietta Swan-Leavitt — relates the period of the pulsation to the absolute magnitude of the star and is found in all pulsating stars. When observing a variable, you can measure its apparent magnitude, and by monitoring the variability of the star over time you can measure its period, thus precisely estimating its distance using the period-luminosity relation.

My decision to do a PhD abroad changed completely after I became the mother of a wonderful daughter. I decided to do the PhD at the same institution, but while my daughter was still small, I took the opportunity to spend several months abroad doing part of my research at the Institute of Astronomy at the University of Cambridge as part of a big collaboration aiming to study the stellar halo of the Milky Way.

My PhD thesis was dedicated to studying the stellar streams and overdensities present in this halo, observable from the southern hemisphere. These stellar substructures are relics of past accretion events from the formation history of the Milky Way. Most of the previously known stellar substructures were discovered from the north, while the southern sky remained relatively unexplored. In my thesis, I explored data collected by wide-field photometric surveys, like ATLAS, the ESO Public Survey carried out by the VLT Survey Telescope (VST), as well as variability and deep photometric surveys. I also proposed my own spectroscopic observations to detect, confirm and characterise several known and new stellar streams populating the southern skies, particularly around the Magellanic Clouds — the biggest satellite galaxies of our Galaxy, which also contain their own stellar substructure.

Choosing ESO was an easy decision, except for the fact that it is located in Santiago, where I have been for all of my career so far. Nonetheless, interacting with frequent visitors from all over the world, and working with colleagues from many countries, it is easy to forget that I am still in my home town. At ESO, I split my time between my own research, some outreach activities in Spanish for school students, and my duties at the VLT. There, I work as a support astronomer at the UT2 (Kueyen) telescope. I execute programmes on behalf of astronomers who want to observe with the Ultraviolet-Visual Echelle Spectrograph (UVES), and the X-shooter and the Fibre Large Array Multi Element Spectrograph (FLAMES), choosing them based on the weather conditions and scientific priorities, and checking in real time the quality of the data we acquire. I also support visiting astronomers who come to Paranal to carry out their observations. Working at Paranal can be tough as it involves night-time work for several nights in a row. However, it really pays off when you can see all the stars embedded in the Milky Way in the spectacular night sky.

Personnel Movements

Arrivals (1 January–31 March 2020)

Europe

Brazil, Fiona (UK)	Head of Human Resources
Davison, Thomas (UK)	Student
Engler, Byron (NZ)	Student
Héritier, Cédric Taïssir (FR)	Engineering and Technology Research Fellow
Scibior, Pawel (PL)	Electrical Engineer
Wegener, Anna-Lynn (DE)	Head of the Department of Communication

Chile

Arrue, Ricardo (CL)	Telescope Instruments Operator
Dullius Mallmann, Nicolas (BR)	Student
Duran, Carlos (CL)	Apex Station Manager
Houllé, Mathis (FR)	Student
Korhonen, Heidi Helena (FI)	Operations Staff Astronomer
Kundu, Richa (IN)	Student
Lagos, Felipe (CL)	Student
Lizana, Vincente (CL)	Software Engineer
Megevand, Vincent (CH)	Telescope Instruments Operator
Messias, Hugo (PT)	Astronomer
Montes, Vanessa (CL)	Systems Engineer
Pessi, Priscila (AR)	Student
Ramirez, Christian (CL)	Optical Coating Engineer
Uzundag, Murat (TR)	Student

Departures (1 January–31 March 2020)

Europe

Fiorellino, Eleonora (IT)	Student
Guglielmetti, Fabrizia (IT)	ALMA Pipeline Processing Analyst
Kabátová, Anežka (CZ)	Student

Chile

Abril Ibáñez, Javier (ES)	Student
Alonso, Jaime (CL)	Electronics Engineer
Bartlett, Elizabeth (UK)	Fellow
Ciechanowicz, Miroslaw (PL)	Head of Engineering group
Desbordes, Christine (FR)	Head of Logistics
Leclercq, Julien (FR)	Mechanical Engineer
Reyes, Claudia (CL)	Telescope Instruments Operator